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RESEARCH ARTICLE

ADOPTION OF SUSTAINABLE LAND MANAGEMENT PRACTICES: THE CASE OF WOLAITA ZONE, SOUTHERN ETHIOPIA

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ABSTRACT

Low land productivity due to land degradation in the form of soil erosion is one of the leading challenges in improving the performance of smallholder farming systems in Ethiopia. This study attempted to assess the factors affecting the adoption of sustainable land management practices and to evaluate the effect of sustainable land management practices on household income in the study area. Primary data were collected through interview schedule and checklists were used for focus group discussions and key informants interviews. 122 respondents were selected by systematic random sampling technique. Descriptive statistics, binary logit model and independent T-test were used to analyze the data. The model output revealed that family size, farm size, household income, age of the household head, land topography and access to market have a significant positive effect on the adoption of sustainable land management practices (SLMP). The computed independent T-test for the mean income difference was statistically significant between adopters and non-adopters; suggesting that adopters were in a better-off position to improve their livelihood. Therefore, policymakers should give attention to factors that significantly influence the adoption of sustainable land management practices in the area.

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INTRODUCTION

Over the last three decades, the government of Ethiopia and a consortium of donors have undertaken a massive program of natural resource conservation to reduce environmental degradation, poverty and increase agricultural productivity and food security. However, the adoption rate of sustainable land management (SLM) practices is low. In some cases, giving up or reducing the use of technologies have been reported (Kassie etal, 2012; Tenge, 2005).Several factors may explain the low technology adoption rate in the face of significant efforts to promote SLM practices. These include a poor extension service system, blanket promotion of technology to very diverse environments, top-down approach to technology promotion (Denis, 2010). Low land productivity due to land degradation in the form of soil erosion is one of the leading challenges in improving the performance of smallholder farming systems in Ethiopia. In this context, the adoption of Sustainable Land Management practices is quite crucial to increase agricultural productivity, ensure food security and improve the livelihoods of small holder farmers.

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Farmers recommended various SLM practices for sustainable implementation, but the adoption of such agricultural land management practices is still very low. There is no clear understanding of the problems encountered by farmers in the adoption of recommended SLM practices (Tesfaye, 2017). Land degradation in Sodo Zuria Woredahas been broadly covered. Soil Erosion Control and Agroforestry Project (SECAP) are among the many efforts that have been done in the area. Johansson (2001) argues that, though SECAP is reported as being successful, the major part of the Woreda is without conservation structures and degradation of natural resources goes on at a higher rate. Although the approach was participatory as it had been involving farmers to see the advantage of conserving through a combined, individual and collective approach to resource conservation, attention to participation and adoption to these conservation practices is still so low (Tenge, 2005). Therefore, this study was conducted to assess factors influencing the adoption of sustainable land management practices and to evaluate the effect of sustainable land management practices on household income in the study area.

MATERIALS AND METHODS

Description of the Study Area: Sodo Zuria Woreda is one of the Woredain Wolaita Zone, Southern Ethiopia. The Woreda is located at a distance of 384 km to the South from Addis Ababa. The agro-ecology of the Woredais dominated by midland that covers about 87% of the total area, and the remaining 13% is highland with rugged mountains and slopes. Damota Mountain is the highest peak (over 2800 m.a.s.l) in the Woreda and is considered as the main water source to the surrounding communities. All the highland Kebeles are located around the mountain. The altitude of the Woreda falls in the range of 1500 to 3200 M.A.S.L. The average annual rainfall of the Woreda is 1200 mm per annum, while the daily temperature varies from 15^{0C} to 30^{0C}. Soil types of the area are mostly clay and clay loam (WFEDO, 2005).

Study Design: The study used a cross-sectional survey study design, where data were collected at a single point in time using a survey method.

Data Types and sources: Both qualitative and quantitative data were collected from primary and secondary sources.

Sample Size and Sampling Technique: The target population for the study was farmers who cultivate crops, vegetables and fruits in Sodo ZuriaWoreda.Among 31 kebeles in SodoZuriaWoredafive Kebeles were selected by using a simple random sampling technique and 122 households were selected as respondents by systematic random sampling technique from those 5 kebeles;the total sample respondents were classified into two groups as adopters (76) and non-adopters (46).

Methods of Data Collection: Data for this study were collected using an interview schedule and checklists for focus group discussions and key informant interviews.

Methods of Data Analysis: Descriptive statistics, inferential statistics, binary logistic regression, and independent T-test were used to analyze the data. Chi-square and t-test were used for cross-tabulation and mean comparison, respectively.

RESULTS AND DISCUSSION

Background Information of the Respondents: In this section, the demographic and socio-economic characteristics of the sample respondents include; sex, age, farmsize, and educational levels are presented and discussed to get the general overview of the respondents and how these characteristics influence SLM practices in the study area. Hence, descriptive analyses were employed to investigate these factors that affect the adoption decision of farmers to SLM practices in the study area. T-test and Chi-square tests were used, respectively to identify potential continuous and dummy variables differentiating adopters from non-adopters.

Sex of the households. It was hypothesized that the sex of the household was negatively related to sustainable land management principles. The study displayed that male-headed households being a reference group, sex of the household head was found significant and with a positive relationship with the adoption of SLM practices. The positive relationship of being male and the adoption of SLM practices could be explained by the fact that most females are more concerned with raising their children and home activities (triple roles of gender) as well as social activities than giving more time for adoption of sustainable land management practices.

The chi-square value (11.362) indicated that there is a statistically significant difference between adopters and non-adopters of sustainable land management practices with respect to the sex of the respondents at less than 1% probability level (Table 1).

Education status of the household head: The education status of the respondents is one of the important factors in the adoption of technologies, and it has an impact on individuals' ability to acquire, process and use relevant information on SLM practices. The chi-square test result ($\chi 2$ =2.263; p= 0.047) indicated that there is a statistically significant difference between adopters and non-adopters of sustainable land management practices with respect to educational status of the respondents at less than 5% probability level (Table 2). Age of the household head. The age of the respondents' was hypothesized as positively related to the adoption of sustainable land management practices. The result of the study shows that the age of the household head is a significant and negative relationship with the adoption of sustainable land management. This is consistent with the study done by Aklilu (2006); found that the age of farmer has a significant influence on the adoption of land management practices. The negative relation may be due to that, the younger the farmer becomes more and more conscious about the importance of adoption of sustainable land management practices.The chi-square test result indicated that there is a statistically significant difference between adopters and non-adopters of sustainable land management practices with respect to the age of the respondents at less than 1% probability level (Table 3).

Family size of the respondents': The t-test result (t-value =5.67; p= 0.007) indicates that the mean difference of family size of adopters and non-adopters is statistically significant at less than 1% probability level (Table 4). This also indicates that there is some relationship between family size and adoption of SLMP in the study area.

Marital status of the household head: The chi-square test result indicated that there is no significant relationship between the marital status of the household head and the adoption of sustainable land management practices (Table 5).

Socio-economic variables

Annual Income of the household: It refers to the amount of money that is obtained by the respondent from different sources per year. It was hypostasized to have a positive relationship with the adoption of SLMP, and the assumption was as income increases, more of the farmland will be conserved i.e. the construction of physical soil and water conservation structures such as terraces, cut-offs, integrated agro forestry and diversified cropping systems. The t-test result (t-value =3.15; p= 0.043) indicates that the mean difference of annual income of adopters and non-adopters is statistically significant at less than 5% probability level (Table 6). This also indicates that there is some relationship between the annual income of the respondents and the adoption of SLMP in the study area. The result agrees with Waithaka *et al*. (2007) that found increase in household income increases the adoption of sustainable land management.

Table 1. Relationship of Percentage distribution of household's sex with SLMP(n=122)

Sex	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
Male	74	97.4	46	100	120	98.4		
Female	2	2.6	0	0	2	1.6	11.362***	0.000
Total	76	100	46	100	122	100		

Source: survey result, 2018: *** significant at 1% probability level

Table 2. Percentage distribution of respondents by Education Status (n=122)

Education Status	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
able to read and write	48	63.16	17	36.95	65	53.28		
unable to read and write	28	36.84	29	63.04	57	46.72	2.263*	0.047
Total	76	100	46	100	122	100		

Source: survey result, 2018: * significant at 5% probability level

Table 3. Relationship of Age with Adoption of SLMP (n=122)

	Adoption of SLMP	
	Age	
	Adopter	Non-Adopter
N	76	46
Mean	36.76	39.5
Std. Dev.	8.11	11.3
t-value	-12.31***	
P-value	0.002	

Source: survey result, 2018: ***, significant at less than 1% probability level;

Table 4. Relationship of Family size with Adoption of SLMP (n=122)

	Family Size	
	Adopter	Non-Adopter
N	76	46
Mean	5.86	6.74
Std. Dev.	2.36	2.04
t-value	5.67***	
P-value	0.007	

Source: survey result, 2018: ***, significant at less than 1% probability level;

Table 5. Percentage distribution of respondents by marital status (n=122)

Marital status	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
Single	13	17.11	16	34.78	29	23.77		
Married	63	82.89	30	65.22	93	76.23	1.276NS	0.918
Total	76	100	46	100	122	100		

Source: survey result, 2018: NS = Not significant

Table 6. Relationship of annual income with Adoption of SLM Practices (n=122)

	Adoption of SLMP	
	Income per year (Birr)	
	Adopter	Non-Adopter
N	76	46
Mean	4241.91	4053.30
Std. Dev.	2999.96	3517.95
t-value	3.15	
P-value	0.043**	

Source: survey result, 2018: **, significant at less than 5% probability level

Table 7. Relationship of farm size with Adoption of SLM Practices (n=122)

	Adoption of SLMP		
	Farm size		
	Adopter		Non-Adopter
N	76		46
Mean	0.98		0.52
Std. Dev.	0.74		0.33
t-value		4.46	
P-value		0.015**	

Source: survey result, 2018: **, significant at less than 5% probability level

Table 8. Relationship of land topography with the adoption of SLMP (n=122)

Land topography	Adoption of SLMP							
	Adopter		Non-Adopter		Total		χ 2- value	p-value
	No	(%)	No	(%)	No	(%)		
Sloppy	71	93.4	2	4.35	73	60		
Not Sloppy	5	6.6	44	95.65	49	40	8.18**	0.033
Total	76	100	46	100	122	100		

Source: survey result, 2018: ** significant at 5% probability level

Table 9. Relationship of Susceptibility to erosion with adoption of SLMP (n=122)

Susceptibility to erosion	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
Susceptible	66	86.84	18	39.13	84	68.85		
Not susceptible	10	13.16	28	60.87	38	31.15	9.162***	0.005
Total	76	100	46	100	122	100		

Source: survey result, 2018: ***significant at 1% probability level

Table10. Relationship of market access with adoption of SLMP (n=122)

Access to market	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
Yes	50	65.79	14	30.43	64	52.46		
No	26	34.21	32	69.57	58	47.54	4.514***	0.008
Total	76	100	46	100	122	100		

Source: survey result, 2018: *** significant at 1% probability level

Table 11. Relationship of Extension Agent Contact Frequency with Adoption of SLMP (n=122)

	Adoption of SLMP	
	Extension Agent Contact Frequency	
	Adopter	Non-Adopter
N	76	46
Mean	25	8
Std. Dev.	10	5.2
t-value	6.73***	
P-value	0.008	

Source: survey result, 2018: ***, significant at less than 1% probability level;

Table12: Relationship of access to credit with adoption of SLMP (n=122)

Access to credit	Adoption of SLMP						χ 2- value	p-value
	Adopter		Non-Adopter		Total			
	No	(%)	No	(%)	No	(%)		
Yes	64	84.21	28	60.87	92	75.41		
No	12	15.79	18	39.13	30	24.59	0.713NS	0.415
Total	76	100	46	100	122	100		

Source: survey result, 2018: NS = Not significant

Table 13. Logistic regression estimates for factors affecting adoption of SLMP

Explanatory Variables	B	Wald	Sig. Level	Exp(B)
Family Size	.190	3.476	.062**	1.209
Farm size	.621	4.060	.014**	1.687
Income	.008	17.875	.000***	1.000
Sex	18.859	.000	.199	.000
Marital status	-18.051	.000	.999	.000
Education	.274	.006	.238	1.315
Extension Agent Contact frequency	-.044	1.340	.437	.957
Access to credits	-.208	.024	.877	.812
Land topography	.725	.692	.015**	.484
Susceptibility to erosion	1.068	.297	.926	2.910
Market access	.018	15.648	.003***	2.000
Age	-0.0761	1.240	.051**	0.158
Constant	11.027	.000	1.000	2.368E4

Pearson- χ^2 value = 144.675*** df =12P = 0 .000
-2log Likelihood =61.779
Prediction success (Overall) = 92.7
Correctly predicted Non Adopter =89.7
Correctly predicted Adopter = 95.1
*, **, *** significant at 10%, 5% and 1% probability level, respectively
Source: Model output

Table 14. Effect of adoption of SLMPs on household income in the study area

Group category	Group mean income	t	sig
Adopters	6,619		
Non-adopters	3,425	7.216***	0.000

Source: survey result, 2018; ***, significant at 1% probability level

Farm size of the household: It was assumed that farmers with larger farm sizes are expected to practice better land management practices. This is due to land management practices and the nature of land conservation involved requires space or large landholding. The t-test result indicates that the mean difference in farm size of adopters and non-adopters is statistically significant at less than 5% probability level (Table 7). The study conducted in Ethiopia by Wegayehu *et al*., 2003; found that farmers who possess small farms or less than 1 hectare are less likely to invest in soil conservation practices. Land topography. The result indicates that there is a positive and significant relationship between land topography and the adoption of SLM practices. Adopters had more sloppy topography than non-adopters of SLM. As the chi-square value ($\chi2$=8.18; P-value=0.033) indicated that there is a statistically significant difference between adopters and non-adopters of SLMP with respect to land topography at less than 5% probability level (Table 8).

Susceptibility to erosion: Susceptibility to erosion refers to the characteristics of the land to be easily washed away by different types of erosion. The chi-square test result ($\chi2$=9.162; P-value=0.005)indicated that there is a statistically significant difference between adopters and non-adopters of SLMP with respect to the nature of the land of respondents at less than 1% probability level (Table 9).

Institutional Variables

Access to market: The study shows that access to market is positively related and significant to the adoption of SLMP and the chi-square test result ($\chi2$=4.514; P-value=0.008) indicated that there is a statistically significant difference between adopters and non-adopters of SLMP with respect to access to market at less than 1% probability level (Table 10).

Extension Agent Contact Frequency: The t-test result (t=6.73; p=0.008) was significant at1% probability level(Table 11). This shows that there were significant relationships between extension agent contact frequency and the adoption of Sustainable Land Management Practices. When farmers have a high number of contact with extension agents, and then the farmers will have a high possibility to adopt SLMP due to the transfer of knowledge and information to the farmers from extension agents.

Access to Credit: As it was indicated in table12 below, out of total 76 adopters 64(84.21%) have access to credit while the remaining 12(15.79%) have no credit access. The chi-square test result($\chi2$=0.713 and p=0.415) indicated that it is not significant and there is no significant relationship between the credit access and adoption of sustainable land management practices (Table 12).

Factors Affecting Adoption of SLM Practices in the Study Area The explanatory variables were tested for the existence of multicollinearity problem using variance inflation factor (VIF) for continuous explanatory variables and contingency coefficient for dummy variables before putting them into the model. Accordingly, the test shows that there is no multicollinearity problem among the variables under investigation. The higher values of the sensitivity and specificity measurements indicate the better classification of the events using the specified model. The estimated coefficients of the logistic regression model show that out of the twelve variables that were hypothesized to explain factors affecting the use of improved SLM practices, six (50%) of the variables were found to be significant, while the remaining six were not significant in explaining the dependent variable. The maximum likelihood estimates of the logistic regression model show that a set of 12 explanatory variables (6 continuous and 6 dummy) were included in the model. Out of the twelve hypothesized variables, six variables such as age, land

topography, family size, farm size, market access and total income of the household were found to have a significant effect on the adoption of SLM practices (Table 13). The variables that are found to be significant are presented and discussed below.

Family size: This variable was found to influence adoption sustainable land management practices positively and significantly at 10% probability level. The odds ratio in favor of adoption of sustainable land management practices increases by a factor of 1.209 as the family size of household head increases by one unit keeping the influences of other variables constant. The possible explanation for this is that as the number of members in the family increases, the more the availability of household laborers.

Farm size: This variable was found to influence adoption sustainable land management practices positively and significantly at 5% probability level. The odds ratio of 1.687 indicates that all other things kept constant, the odds ratio in favor of adoption of SLM practices increases by a factor of 1.687 as the farm size of the household increases by one hectare. The possible explanation for this is that farmers with larger farm sizes are expected to practice better land management practices whereas farmers who have smaller farm size are less likely to invest in soil conservation practices.

Income of the household: This variable was found to influence adoption sustainable land management practices positively and significantly at 1% probability level. The odds ratio of 1.000 indicates that all other things kept constant, the odds ratio in favor of adoption of SLM practices increases by a factor of 1.000 as the income level of the household increases by one unit. The implication of this result is that as income increases, more of the farmland will be conserved via the application of physical soil and water conservation structures.

Land Topography: this variable was found to influence adoption sustainable land management practices positively and significantly at 5% probability level. The odds ratio in favor of adoption of sustainable land management practices increases by a factor of 0.484 as the slope of the land increases by one unit keeping the influences of other variables constant. The possible explanation for this is that for farmers who have more sloppy land, there is a high probability of utilization of SLMP than farmers with less sloppy land.

Access to market: this variable was found to influence adoption sustainable land management practices positively and significantly at 1% probability level. The odds ratio in favor of adoption of sustainable land management practices increases by a factor of 2.000for households who have market access keeping the influences of other variables constant (Table 13).

Age of the household head: this variable was found to influence adoption sustainable land management practices negatively and significantly at 10% probability level. The odds ratio of 0.158 indicates that all other things kept constant, the odds ratio in favor of adoption of SLM practices decreases by a factor of 0.158 as the age of the household head increases by one year. The implication of this result is that as the age increases the person may not become more conscious about the importance of adoption of sustainable land management practices.

Effect of Adoption of SLMP on Household Income: Regarding the income of adopters versus non-adopters, the mean incomes of the two groups were calculated. The mean income of 3,425 Birr and 6,619 Birr per year were found for non-adopters and adopters, respectively. The computed independent T-test for the mean difference between the two groups was statistically highly significant ($t= 7.216$; $p<0.001$) (Table 14). This suggests that households who have adopted sustainable land management practices are in a better-off position to improve their livelihood than those who have not adopted. As the farmer can diversify and be able to afford SLM practices expenses and hold their livelihood sustainable.

Conclusion

Land degradation is one of the major challenges in agricultural production and productivity in many parts of the world, especially in developing countries, including Ethiopia. The main objectives of the study were to assess factors influencing adoption of sustainable land management practices and to evaluate the effect of sustainable land management practices on household income. The model output revealed that family size, farm size, household income, age of the household head, land topography and access to market are the main factors influencing adoption of sustainable land management practices in the study area. Regarding the effect of adoption of SLMP on household income, households who have adopted sustainable land management practices are in a better-off position to improve their livelihood than those who have not adopted. Based on the findings, the following points are forwarded as recommendations and policy implication: the government and policymakers should focus on improving skill of extension staff in-line with increasing their number and their availability for well-organized and useful dissemination of technologies; policy interventions should improve market integration, productivity and the bargaining power that will ultimately increase the household income that will stimulate adoption; and focus should be given for land ownership, intensification and diversification of high-value crops and livestock along with increasing off-farm income.

Conflict of Interest: *The authors declare no conflict of interest.*

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REFERENCES

Aklilu, A. 2006. Caring for the Land Best Practices in Soil and Water Conservation in Beressa Watershed, Highlands of Ethiopia.Papers,No76. Tropical Resource Management, Ethiopia. 34pp.the study expects

Denis, D. 2010. Binary Logistic Regression Using SPSS. Department of Psychology, University of Montana, Missoula, Montana. 17pp.

Johansson, L. 2001. Ten Million Trees Later, Land Use Change in the West Usambara Mountains. The Soil Erosion and Agro forestry Project in Lushoto District, Eschborn, Germany.163pp.

Kassie, M., Ndiritu, S. W. and Shiferaw, B. 2012. Determinants of food security in Kenya, a gender perspective. Contributed Paper Prepared for Presentation at the 86th Annual Conference of the Agricultural Economics Society, University of Warwick, United Kingdom. 31pp.

Tenge, A. M. 2005. Participatory Appraisal for Farm-level Soil and Water Conservation Planning in West Usambara Highlands, Tanzania. Wageningen University.113pp.

Tesfaye Samuel, 2017. Determinants of Adoption of Sustainable Land Management (SLM) Practices among Smallholder Farmers' in Jeldu District, West Shewa Zone, Oromia Region, Ethiopia. *Global Journal of Science Frontier Research, 17(1): 122-140.*

Vohland, K. and Barry, B. 2009. A review of in situ rainwater harvesting (RWH) practices modifying landscape functions in African drylands. The Journal of Agriculture, Ecosystems and Environment 131(4): 119 – 127.

Wagayehu, B. and Lar, D. 2003. Soil and Water Conservation Decision of Subsistence Farmers in the Eastern Highlands of Ethiopia: A Case Study of the Hunde-Lafto. Department of Geography and Environmental Studies. Mekelle University, Ethiopia. 121pp.

Waithaka, M., Thornton, P. K., Shepherd, K. D. and Ndiwa, N. N. 2007. Factors Affecting the Use of Fertilizers and Manure by Smallholders: The Case of Vihiga, Western Kenya. Eastern and Central Africa Programme for Agricultural Policy Analysis, Entebbe, Uganda. 110pp.

WFEDO (Wolaita Finance and Economic Development Office), 2005. Annual report. WFEDO: Wolaita Sodo.

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